

## **Fire Alarm Specification for Voyager Panel System Installation**

**Please note:**

**The following text is available to selected CEL customers to assist in the specification of both the panel and system installation (and, if required, maintenance).**

**This text is designed for the specifier to use as a “ready to go” text enabling the panel and system supplier to be specified as the preferred supplier.**

**The system supplier must ensure that he is fully able to support the contractual requirements of the specification. Your attention is drawn to all parts of the “Fire Alarm Installation” section of this document, which you may want to edit to conform to your own procedures.**

**The “Manufacturers’ Codes and Standards” section on the first page of the specification provides space for the insertion of your company name.**

## **FIRE ALARM SYSTEM SPECIFICATION**

### **General**

The Electrical Sub-Contractor shall employ the services of the designated Fire Alarm Specialist Supplier for the design, supply and commissioning of the fire alarm system. It shall consist of fire alarm sounders, break-glass units, heat and smoke detectors and control units.

The system shall be 24 volt d.c. operation, and the complete system shall fully comply with the requirements of BS 5839 Part 1.

The fire alarm system shall be wired as 2 core signal loops. Alarm sounders may be either wired from the control unit, or in the case of loop powered sounders or interface units, connected via the signal loop. In the latter case, fire rated cable shall be used for signal cable and shall fully comply with the requirements of BS 5839 Part 1.

### **Manufacturers Codes and Standards**

All equipment supplied as part of the fire detection system shall conform to the following international standards.

EN 54-European Standard for Fire Detection and Alarm Systems for Buildings.

ISO 9001-Manufacturing Quality Management System, as certificated by the LPCB or other National Accreditation Agency.

The fire alarm indication equipment shall be the "Voyager" panel as manufactured by Control Equipment Ltd. The detection equipment shall be the "Discovery or XP95" devices as manufactured by Apollo Fire Detectors Ltd.

To maintain compatibility throughout the complete system, for the purpose of tendering, the above manufacturers equipment shall be included in the tender bid. Equal or equivalent equipment may be offered provided that all requirements of the specification are fully met.

The fire alarm specialist supplier shall be one of the following:-

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- X X X X X

### **Fire Alarm Control Panel**

#### **Panel Compliance**

The fire alarm control panel shall be compliant with BS EN 54 Part 2 (Control and Indication) and Part 4 (Power Supply).

#### **Panel Construction**

The housing containing the fire alarm control panel shall be of 1.2 mm thick steel construction finished in RAL 7035 Textured Light Grey.

It shall be capable of being surface, semi-flush or fully flush mounted with an additional bezel. The fully flush bezels shall be painted to specification, stainless steel or brass as required.

Flush fixed knockouts shall be provided for all surface cable entries with the mains supply segregated from the low voltage entries. Rear entry knockouts shall also be provided as standard.

The housing shall afford a minimum ingress protection to IP30 and it shall not be possible to open the fire alarm control panel without the use of a special key.

### **Fire Alarm Panel - Functional Description**

The fire alarm control panel shall be the central processing unit of the system, providing audible and visual information to the user, initiating automatic alarm response sequences and providing the means by which the user interacts with the system.

The fire alarm control panel shall be able to be easily configured to meet the exact detection zone and cause / effect output requirements of the building.

Operating programs and configuration data shall be stored in a non-volatile memory and fully configurable on-site by means of upload / download p.c. configuration software.

It shall be possible to expand the panel from 1 to a maximum of 2 loops with a "plug in" individual loop card.

It shall be possible to expand the panel with a minimum of 248 programmable alarms / relays and 248 programmable fire / non-fire panel inputs.

A minimum of 126 individually addressed standard devices shall be capable of being configured on each addressable loop.

Each loop card shall be capable of providing 500mA current and shall maintain a minimum of 24 volts on the loop up to the full extent of the battery standby period.

It shall be possible to fit a 20-column printer to the fire alarm control panel that will print system events automatically and log data upon request.

The fire alarm control panel shall have provision to drive and monitor a minimum of 13 repeater panels each providing full end user controls event display facilities.

The fire alarm control panel shall be capable of monitoring and controlling remote site devices, such as relays for the control of plants and dampers directly from the addressable loops.

The fire alarm control panel shall interrogate each addressable detection device and provide alarm indication within 3 seconds of a manual call point operation and 10 seconds for all other devices.

The fire alarm control panel shall have the ability to annunciate an alert or pre-alarm condition designed to give the earliest possible warning of potential fire condition without raising the full alarm condition.

The fire alarm control panel shall have, as standard, automatic drift compensation to prevent false alarms due to detector contamination, and shall give warning when compensation limits are reached.

### **Fire Alarm Panel - Indications**

The fire alarm control panel shall monitor the status of all devices on the addressable loops for fire, short-circuit fault, open-circuit fault, incorrect addressing, unauthorised device removal or exchange, alert or device maintenance condition.

The fire alarm control panel shall monitor all alarms circuits and remote silence alarms, reset, evacuate and fault inputs for open or short circuit faults.

The fire alarm control panel shall also monitor the status of internal connections and interfaces including charger and batteries.

The following LED indications shall be provided

POWER SUPPLY ON	Green LED
FIRE	Red LED
ALERT	Amber LED
SYSTEM FAULT	Amber LED
GENERAL FAULT	Amber LED
ALARM FAULT/DISABLEMENT	Amber LED
DELAY ON	Amber LED
MAINTENANCE	Amber LED
GENERAL DISABLEMENT	Amber LED
BUZZER SILENCED	Amber LED
TEST	Amber LED
MORE MESSAGES	Amber LED
ZONE FIRE	Red LED per zone
ZONE FAULT	Amber LED per zone

In addition to the indications above, the fire alarm control panel shall also have an integral 4 x 20-character LCD alphanumeric display. The LCD display shall be arranged as follows:

Line 1: Loop number, Device Number, Zone Number, Device Type, Device Status.

Line 2: Alpha numeric text message definable by client / installer.

Lines 3 and 4 shall be as above and used to display the second and any subsequent events.

The first event to display shall remain on the display. The user may then scroll the lower part of the display for the third and subsequent events.

A "Test Display" facility shall provide a facility to manually check all the discrete LED indicators. The fire alarm control panel shall provide facilities for remote signalling of fire and fault conditions.

### **Fault Reporting**

The fire alarm control panel shall monitor system components and interconnections in accordance with BS EN 54 part 2, such that a failure shall cause a fault indicator to light and a message to be given on the alphanumeric display within 100 seconds of occurrence.

The following faults shall be reported: -

- Loop Fault
- Loop Device "Double Addressed"
- Loop Device Removed
- Alarm Circuit Fault
- Repeater Fault
- PSU Fault
- Earth Fault
- Battery Fault
- Mains Failure

To help faultfinding and repair, the fire alarm control panel shall provide text messages to indicate the location of where a fault has occurred in the system.

### **System Management**

The fire alarm control panel shall incorporate the following end user system management facilities:

- Disable / enable an individual loop device
- Disable / enable a group of devices
- Disable/ enable a zone of devices
- Disable /enable panel inputs
- Disable / enable alarm signalling devices
- Disable / enable printer

Configure fire relay on evacuate  
One person silent test for detectors  
One person test for alarm devices  
View devices disabled  
View event log  
Print event log

The fire alarm control panel shall have an event log capable of storing up to the last 200 events. These events shall be individually time and date stamped. It shall be possible to view and print the content of the event log.

Events shall be displayed in chronological order with the newest events first. It shall be possible to scroll through the events when viewed on the LCD display.

The fire alarm control panel shall be capable of disabling an individual detector, a group of detectors, and/or zone of detectors for building maintenance purposes.

The fire alarm control panel shall have a facility to enable the user to easily change the time and date settings of the system 'real time' clock. It shall also be possible for the user to change the alpha-numeric text message by means of an additional QWERTY keyboard.

It shall be possible for the end user to perform a non-latching one person device test without sounder or cause/effect operation or access to the engineers' configuration menu.

#### **Panel and System Configuration**

Operating programs and configuration data shall be stored in a non-volatile memory and fully configurable on-site by means of upload / download p.c. configuration software. Configuration data shall be retained on a floppy disk for backup purposes.

The panel shall provide 32 indication zones with a minimum of 255 groups overall available for cause / effect programming. It shall be possible to allocate every loop and panel input into at least 8 different groups for indication and cause / effect programming.

The following categories shall be available for cause / effect purposes: -

- Zone Fire Single Knock Operate Until Reset
- Zone Fire Single Knock Operate Until Silence Alarms
- Zone Fire Double Knock Operate Until Reset
- Zone Fire Double Knock Operate Until Silence
- Zone Alert Operate Until Causes Clear
- Zone Fault Operate Until Causes Clear
- Zone Indication Operate Until Causes Clear
- Common Fire Operate Until Reset
- Common Fire Operate Until Silence
- Common Alert Operate Until Causes Clear
- Common Fault Operate Until Causes Clear
- Common Indication Operate Until Causes Clear
- Alarms Silenced Operate Until Causes Clear
- System Reset Operate Until Causes Clear
- Evacuate Operate Until Causes Clear

The fire alarm panel shall have, as standard, the ability to set the detector sensitivity for each Discovery detection device on a day-night basis by a seven-day programme.

The fire alarm panel shall have, as standard, the ability to use a minimum of two loop inputs for changing the sensitivity of XP95 and Discovery devices manually in areas requiring random sensitivity changes. Operation of these inputs shall be in addition to the seven-day sensitivity programme.

It shall be possible for the end user to switch between day only, night only, automatic (seven-day programme) and off.

The fire alarm panel shall have, as standard, the ability to configure a daytime delay of all alarm and relay outputs for up to 10 minutes. The daytime period and delay function shall be fully configurable by the commissioning engineer. It shall be possible for the end user to enable or disable this delay function.

### **Panel Sounder Control**

The fire alarm control panel shall provide the necessary output to operate a minimum of two monitored circuits of common system sounders. Each output shall be capable of driving a sounder load of up to 1A

The fire alarm control panel shall be capable of providing a two-stage alarm sounder facility that can be programmed, either by device, zonal or common system basis. This facility shall be provided by the use of additional 8 way programmable alarm cards. The panel shall be capable of controlling a minimum of 31 x 8 way alarm cards. Sounder output shall be available as follows:

- Alert, intermittent pulsed tone
- Evacuate, continuous tone

All fire conditions shall visually and audibly indicate on all panel displays immediately upon receipt of the signal but the fire alarm control panel shall also have the ability to delay all sounder and relay outputs on a day / night time basis. A sounder / relay output delay of up to 10 minutes shall be possible from all smoke and heat devices. Call points and Evacuate signals shall automatically override any delay. A user "Delay Override" shall also be provided. When the system is outside the delay-enabled time then all devices shall provide instant signalling.

Panel and remote display functions and indications, printer and radio pager operations shall not be inhibited or delayed at any time.

### **Detection devices - General**

Detectors shall comply with and be type certified to EN 54 Part 7 for smoke detectors and Part 5 for heat detectors.

Detectors shall have five response modes which cover a range of sensitivities and response times. The mode for each individual detector shall be set via the fire alarm control panel. The response mode of any detector may be changed from the control panel at any time.

If, within one second of last being polled by the fire alarm control panel a detector reaches its own predetermined fire threshold the detector will place an alarm flag and its own address on the data stream to facilitate location by the fire alarm control panel.

Each detector shall have its own mounting base which, with the exception of isolating bases, will not contain any electronic components. Detectors will be capable of being locked into the mounting bases to avoid unauthorised removal of the detector.

The loop address of detectors shall be set by inserting a coded plastic card into each mounting base, allowing up to a maximum of 126 unique address codes. The address will be a simple seven bit binary code, set at the time of commissioning. The detector address card will be held in the base so that it cannot be accidentally removed with the detector. Each address card will provide a space visible from below when the detector is in place. The loop number and individual address or any other information specified by the client will be marked in the identifier provided.

Two alarm LEDs shall be provided on each detector. The LEDs will be controlled by the fire alarm control panel, independently of the device. LEDs shall be capable of being reset by the fire alarm control panel without removing power from the loop.

Detectors shall be capable of being remotely tested from the control panel by transmission of a single bit in the communication protocol. Detectors will respond by providing an analogue value in excess of the recommended fire threshold to indicate a healthy condition. The control panel shall recognise this response as a test signal and will not raise a general alarm.

Detector housings shall be moulded in pure white self-extinguishing polycarbonate, V-O rated to UL94. Detectors will be unobtrusive when installed.

#### **Additional Specifications for Ionisation Smoke Detectors**

The following specifications are in addition to the common specifications for detectors and apply to ionisation smoke detectors only.

Ionisation smoke detectors shall be analogue addressable, suitable for detection of visible and invisible products of combustion, and will be of the dual chamber single source type.

The radioactive source shall be Americium 241 with an activity level not exceeding 0.9  $\mu$ Curies. The source will be mounted securely and shall require the use of special tools to permit extraction by authorised personnel only. Detectors shall be type certified by the National Radiological Protection Board or a similar body.

Smoke entry points shall be protected against ingress of dust and insects by corrosion resistant gauze.

Build-up of dirt or other environmental contamination on the radioactive source may cause a variation in the analogue output from the detector. The detector shall apply compensation to this variation, and will record the level of compensation in non-volatile memory. When drift compensation reaches a preset level, the detector will set the drift compensation flag, which the fire alarm control panel will identify and initiate a visible signal to indicate that the detector is in need of service.

#### **Additional Specifications for Optical (Photoelectric) Smoke Detectors**

The following specifications are in addition to the common specifications for detectors and apply to optical (photoelectric) smoke detectors only.

Optical smoke detectors shall be analogue addressable, suitable for detection of visible products of combustion, and will be of the light scattering type using a pulsed internal infra-red LED and a silicon photodiode receiver.

The optical sensing chamber shall be configured such that the horizontal optical bench housing the LED emitter and sensor is arranged radially to detect forward scattered light.

Smoke entry points shall be protected against ingress of dust and insects by corrosion resistant gauze.

Build-up of dirt or other environmental contamination in the optical chamber may cause a variation to the analogue output from the detector. The detector shall apply compensation to this variation and will record the level of compensation in non-volatile memory. When drift compensation reaches a preset level, the detector will set the drift compensation flag, which the fire alarm control panel will identify and initiate a visible signal to indicate that the detector is in need of service.

#### **Additional Specifications for Temperature (Heat) Detectors**

The following specifications are in addition to the common specifications for detectors and apply to temperature (heat) detectors only.

Temperature detectors shall be analogue addressable, suitable for detection of rate-of-rise of ambient temperature and fixed temperature threshold. Detection will be by means of a single NTC thermistor.

Temperature detectors shall be capable of protecting an area of up to 50m<sup>2</sup> when mounted at heights of up to 13.5m using the maximum sensitivity setting.

### **Additional Specifications for Multisensor Detectors**

The following specifications are in addition to the common specifications for detectors and apply to multisensor detectors only.

Multisensor detectors shall be analogue addressable, suitable for detection of visible products of combustion (smoke), rate-of-rise of ambient temperature and a fixed temperature threshold. The response modes, which combine the smoke and temperature sensor outputs of the detector in different ways, will be controlled via the fire alarm control panel.

Modes are numbered 1 to 5, and characteristics are as follows:

Mode 1 has a very high smoke sensitivity combined with high temperature sensitivity.

Mode 2 has a smoke sensitivity similar to that of a normal optical smoke detector, but has no response to temperature.

Mode 3 combines moderate smoke sensitivity with moderate heat sensitivity.

Mode 4 has a lower than normal smoke sensitivity combined with moderate sensitivity to heat.

Mode 5 has no smoke sensitivity at all but gives a pure heat detector response.

Build-up of dirt or other environmental contamination in the optical chamber may cause a variation in the analogue output from the detector. The detector shall apply compensation to this variation and will record the level of compensation in non-volatile memory. When drift compensation reaches a preset level, the detector will set the drift compensation flag, which the fire alarm control panel will identify and initiate a visible signal to indicate that the detector is in need of service.

### **Specification of Manual Call Points (MCP)**

Each MCP installed on the loop shall have a unique address, set at the commissioning stage by means of a seven-segment DIL switch.

The elapsed time between activation of the MCP and initiation of the sounders in an alarm condition via command from the fire alarm control panel shall not exceed three seconds.

### **Fire Alarm System Installation**

#### **Wiring Diagrams**

A system schematic wiring diagram shall be obtained from the fire alarm specialist supplier and submitted to the specifying engineer prior to commencement of work.

A full set in duplicate of all relevant maintenance manuals, systems wiring diagrams and 'as fitted' drawings showing details of the route of the loop circuits and the device label numbers are to be provided and handed over to the specifying engineer on completion of the work.

The complete fire/alarm system shall be tested and commissioned by the specialist installer and a certificate issued to this effect.

The installer shall ensure that the 'as fitted' drawing shows details of the route of the loop circuits and the device label numbers, and shall provide cable test certification prior to commissioning.

### **Supply To System**

The system shall be supplied via a SP/N switch fused at 5A fully conforming to the requirements of BS 5839 Part 1.

### **Fire Alarm Systems Zone/Loop Designation**

The electrical contractor shall install new cabling to cover all fire alarm equipment as detailed on the contract drawings. The system shall be zoned as shown on the contract drawings.

The new fire alarm equipment shall be connected to the loops as designated on the drawings. Short circuit isolators shall be installed on the loops between each zone.

The devices shall be connected and wired sequentially and marked on the "as fitted" drawings to assist future engineering functions.

### **Input/Output Units**

The Electrical Contractor shall install input/output units on the alarm/signal loop located as shown on the contract drawings.

The input/output units are either loop-powered or 24 volt dc powered, and require a separate address used to control equipment as indicated on the contract drawing.

From each input/output unit a 1.5mm fire rated cable shall be run (via a heavy duty relay) to each item of plant being controlled. All cable installations shall fully conform to the requirements of BS 5839 Part 1.

For 24volt powered units the contractor shall be responsible for provision of suitable battery backed supply units and cabling as required.

### **Fire Alarm Sounders**

The sounders shall be mounted at approximately 2000mm above ground floor level to the bottom of the sounders. The sounders shall be suitable for direct conduit box mounting, unless provided with integral backbox large enough for cable glanding up to 2x 2.5 mm.

The electrical contractor shall supply and install new fire alarm sounders at the positions indicated on the contract drawing.

### **Device Labels**

The Sub-Contractor shall allow in his tender for the labelling of the fire alarm system by the fire alarm specialist supplier.

This shall consist of the programming of the fire alarm panels in such a way that each remote device is identified in a standard format address.

The Sub-Contractor shall at the start of the contract agree all labels with the employer or their representative.

Each software address shall be supplemented by a hard address label mounted local to each remote/device.

### **Programming of System**

The Electrical Contractor shall arrange for the fire alarm specialist supplier to properly programme the fire alarm system. The exact requirements for programming shall be agreed with the Engineer on site.

The Electrical Contractor shall be responsible for providing the completed programming sheets to the fire alarm specialist supplier to enable the manufacturer to programme the control panel correctly.

### **Inspection, Testing and Commissioning**

The Contractor shall allow in his tender for the complete commissioning of the fire alarm system by the specialist fire alarm supplier.

Commissioning must be carried out in the presence of the Engineer and a certificate issued to this effect.

The whole of the fire alarm installation should be inspected, tested and commissioned in accordance with clause 26 of BS 5839 part 1 and as further described. The Electrical Sub-Contractor shall employ the fire alarm specialist installer/supplier to commission the system.

Commissioning shall be carried out in accordance with Clause 26.5 of BS 5839 part 1 which shall include:-

- 1 An audibility test of the alarm devices. Audibility level readings shall be taken in each room. Any sound levels found to be lower than 65 dba shall be reported to the Engineer in writing.
- 2 All trigger devices ie: manual call points, heat and smoke detectors shall be tested for correct operation.
- 3 A mains failure test shall be carried out to verify correct operation of the back-up battery system.

Prior to commissioning the Electrical Sub-Contractor shall provide a certificate of installation and cable test certificates of the system to the engineer.

### **Fire Designation Drawing**

The Fire Alarm Specialist Supplier shall supply and install a fire zone chart showing plans of the building with all fire alarm control and indicating equipment clearly indicated. Each fire compartment/zone shall be easily identified by means of clearly marked colour codes.

The fire zone chart shall be as a minimum sized A3, coloured and suitably framed for handover on completion of the works.

### **Spare Parts**

The Sub-Contractor shall supply to the Employer the following spare components.

- |    |   |  |
|----|---|--|
| 1, | Breakglass-glasses                                  | 10in number per 100 installed (minimum 10) |
| 2, | Smoke detectors c/w addressable facility            | 2 in number per 100 installed (minimum 2)  |
| 3, | Heat detector c/w addressable facility              | 2 in number per 100 installed (minimum 2)  |
| 4, | Sounders c/w addressable facility as applicable     | 5 in number                                |
| 5, | Complete Break glass units c/w addressable facility | 2 in number                                |

**Maintenance**

The Fire Alarm Specialist Supplier shall include in his price for the cost of comprehensive maintenance of the system for a period of 12 months from the date of commissioning.

This cost shall allow for a 24 hour engineering maintenance cover and repair of any defect or replacement of defective components as required.

In addition, the Contractor shall include in his tender for the specialist fire alarm supplier to carry out on behalf of the employer (the user) the first three quarterly (3 monthly) inspections and tests as called for in clause 29.2.4 of BS 5839 after the date of handover and completion of the contract. Also the annual inspection test on behalf of the user as defined in clause 29.2.5 of BS 5839. Suitable reports shall be prepared for these events and copied to the Employer and Engineer.